

For example, Sensors, limit switches,
Emergency switches, Thermostats,
Overload is all of these any one will
be opened. And if all of this
is OK, then any of the control
wire is disconnected / detached.

Or there is any of the auxiliary
of relay and contactor will be faulty
Or there is short circuit in
synchronizing control circuit means
there is melt of connector boxes
box switches or this is wire
internally short.

2) Stop of machine running:

Any of the safety operate
or any of drive stop and
any of the motor heatup.

Any of the sensor short

Any coil of solenoid valve burned.

There is drop of voltage of
control circuit. Any of the wire


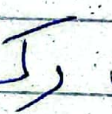
detatched / disconnected or there is

short circuit in control circuit. or

Emergency is pushed by anyone
by mistake.

3) Machine is taking Jerking :-

Any of the connectors loose.

The armature volt of drive
or any of the drive output
voltage coming ( , ) jerking.

Or if ~~any~~ of ~~the DC motor~~
the motor is DC then it is

most probably the carbon of the
motor become faulty or bearing of
the motor become faulty. Then

the mechanical load from any
of the side become jam. The
roll bearing of the motor become

damage. To check the bearing of the roll / motor place the hand on the cover and if the cover is hot then the bearing is faulty.

④ Machine suddenly stop by blast :-

If the blast is of low intensity then fault will be in control circuit. and if blast is of high intensity then fault will be in Power Circuit. In Drive the panel, cable, motor, connector

logs of machines - this will be
short circuit

~~Machine~~ Note :- Those
~~Machines~~ ^{Motors} which move on the Machine
their cable tear due to rubbing
due to this is short circuit. And
we don't find fault because
when machine stop due to
short circuit it stop suddenly with
vibration and wire disconnect from
the body. In this case we
search the fault of short circuit on
motors side which are moving. Any

of the motors on the machine
we use always GFI pipe
flexable and we not use PVC
pipe. And for motor terminal
cable always pass through from the
down side not from upper (top)
side. Those motor which are on the
outside the plant where there is
possibility of coming / dropping of water
or where steam or chemical use
there we use dog ear always.

Project of DC Motor

To run the DC motor in reverse and forward direction
To on the DC drive through DDC circuit one thing should remember that by OFF mainbrake control circuit still active. and Power (ON) ~~as the~~ by mainbrake (ON). To run motor clockwise and anticlockwise we made reverse forward circuit. The field voltage will directly through to the Motor. And Armature is

through to the motor through
contactors. In this panel working
first made power circuit and control
circuit separately.

8/6/2022

Variable Frequency drive VFD

Recently all of industry in order to get job we have to command on VFD. because all induction motor are control and run by VFD. In CV. there is not mention on VFD level then there is no job. As compare to DC drive, VFD is more sensitive and on it only the senior people will work. Basically VFD is programmable device.

Advantages of VFD.

- i) It provide 0 — 400 hertz
- ii) It comes in Resistive load and 30% electricity is saved.
- iii) Torque is completely eliminated
- iv) Provide us display.
- v) Control rpm from zero.
- vi) Easiness is come in process Synchronizing (Automate) ~~of motor~~ To synch the two or more motors and to control them. (Automate) It is also called Inverter in Industry.
- VFD is also of single phase, 3 ϕ .

Other than that it has DC ~~input~~^{IN} also available. and.

it provide always 3 ϕ AC in its output. Through VFD.

only 3 ϕ AC run can run.

Basically there are two types of VFD.

i/ NORMAL APPLICATION TYPE

ii/ COMMUNICATION APPLICATION TYPE.

The programming of VFD parameters is also called setting. And the important task in VFD is its

Parameter cannot
be set without reading the
programming.

Manual. Parameter setting is
done with the help of
KEY PAD on its body. And some
VFD which are communication based
can be programmed through
~~the~~ computer. Regardless of
orand VFD has range from
0.2 HP till 500 HP larger.

Means every range of VFD is
available, Any of the motors
which we set according to

Logic and APPLICATION,
and some parameters are shown
on DISPLAY. But, mostly
Hertz setting is done on
the Display. VFD cannot
be set according to the Logic
until we don't know how to
read the Manual. And according
to motor parameters were
set by seeing the manual.
On Heavy duty VFD cooling
fans are also installed for
its cooling where are of 220V,

24V, 110V, and some
are of double phase. So,
When error of cooling fan
come on VFD than during
changing of Fan, voltage must
carefully match the old one. In
the same way every fault on
VFD show in Display in the
form of CODE and we have
to remove by reading from the
manual.

Q1) Why it is necessary for motor of STAR and delta connection

Q2) Where there is 3 ϕ there Δ and Y is required? Why?

Installation of VFD

The VFD which we are working is of model no. VF57-2015-400. And its make is Toshiba Japan. Basically all VFD has same function. Whether it is any type of VFD the of brand/company it has outside and difference in control side connections or difference in switches addresses.

① During VFD it must be carefully kept in mind that it must be installed and place in cool and covered area

② It place vertically. And protect from dust and flup.

③ During VFD installation by understanding the system connects by manual according to its diagram.

④ From 1 inverter only
1 motor can be run but
in machines on some m/c's
for operation / application
and powers more than 1
or more motors can be run.

VFD on machines can be
run by many references.

m/c is set on specific reference
and run and always one
reference run. So that during installation
of VFD it must be care of
reference. Example control

voltage 0-10V , 4-20
mA , ~~control~~ tension control ,
control weights and some VFD
have Jog switch.

⑧ VFD parameters are set
according to logic and
application . • solve cannot ~~touch~~
change any parameter according to
our wish and not touch.

That's why on some VFD
some display have provision
of detached.

On what basis junior are
advised to not touch VFD.

① They have fear that
junior not connect i/p and o/p

② Do they cannot touch the
parameters on running condition.

Means those parameters which
are marked with asterisk * on
the manual these parameters are
avoided to touch.

③ VFD parameters have one
dependent value to those
called initialize (means ^{become} zero)

to touch this parameters can
reset all parameters and
come on factory setting. due
to which set parameters are
Out.

Note:-

In your responsibility all
the VFD installed its

parameters are known / note

(those used for running condition)

④ Do know the knowledge
of motor and its voltage of
m/c. What is this.

Q How many types of 3ϕ ?

The one who show 220V

Phase to phase it is called $3\phi(220V)$

and those motor who are 220V (3ϕ)

are always run by VFD and

run on Delta (Δ).

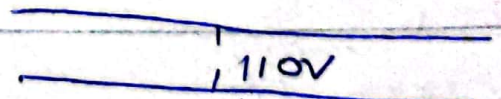
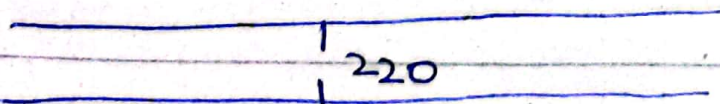
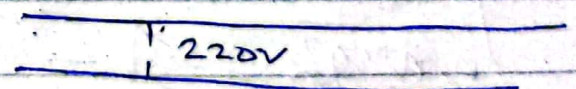
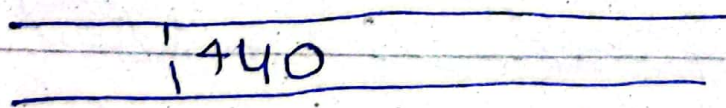
There are three types of

3ϕ

i/ 3ϕ 11000V = H.T motor

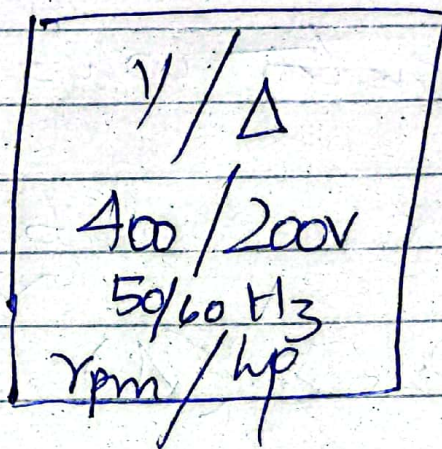
ii/ $3\phi(440V)$

i/ $3\phi(220V)$



So,
VFD o/p 400(3 ϕ)
3 ϕ 'Y'

So,
VFD o/p 3 ϕ (220v)
1 ϕ "Δ"



And the one who tell 400v
on phase to phase it is called
3 ϕ (400v) and those motor
who are 3 ϕ (400v) are ^{also} run
through VFD as well as Electrical
circuit.

⑤ Those motors who ~~to~~ have high Hertz these motors are always run through VFD, not run by direct.

⑥ VFD can be run by many references. The m/c and plant is set one some references and it always run through the same reference as setted. For these references in machines the hopping cable and can bus cables are used which are controlled by PLC command.

During VFD install one should read the name plate of motor and use slightly higher power of VFD than power of motor. In ^{VFD} Dynamic braking resistor is provided which is optional and depend upon application. Means VFD have Electrolytic capacitors through dynamic resistors these capacitors were discharged. So, that due to mechanical load reverse emf will not effect and provide brake at once. Braking

resistors are of different ^{ohmic} values and these are also according to model Number and I/P. and purchase separately and are of Silver body.

Every VFD have different manual whether it is of some company. Means Different model have different manual. Mostly those VFD which are used in Industrial m/c's are as below which have more parameter.

① Lenze (3500 features)

- ② Siemens (2200 p)
- ③ ABB (2500)
- ④ Danfoss
- ⑤ L N Berle
- ⑥ Telemeknit
- ⑦ M ushborshi
- ⑧ Toshiba
- ⑨ Reliance
- ⑩ KEU
- ⑪ Omron
- ⑫ INVT (Pakistan mostly use this invented)
- ⑬ Puma
- ⑭ Delta
- ⑮ C-2000

⑫ LS — LG (There were not use and where placed replace it with other running brand)

VFD Parameter

Setting

Any VFD, the parameters were set according to its logic of the m/c and not set without reading the manual.

And whenever we have to set or change the parameter it is always done with the same method.

To run the VFD, see the

Page no 20 of manual, Command
mode selection can set either of
these two modes. Select the
Code of Cnoc on display
and select the '0' on the
terminal block and then run
and stop is used to run. To
set the Cnoc on 1 for
run and stop key settings. As
soon as we ON the supply of
VFD then on display '00'
will come and then we press
(MON) button and then on single

click up and down, with help

ENTER Press single time

then up and key show 1 on display. This is save to the memory of VFD. Press ENT switch one time. Then after some moment to come out from program press 2 times MON key then on display 00 will come. Then through RUN

switch a command is given, then

it starts running. Whenever we

have to set ~~any~~ parameter then

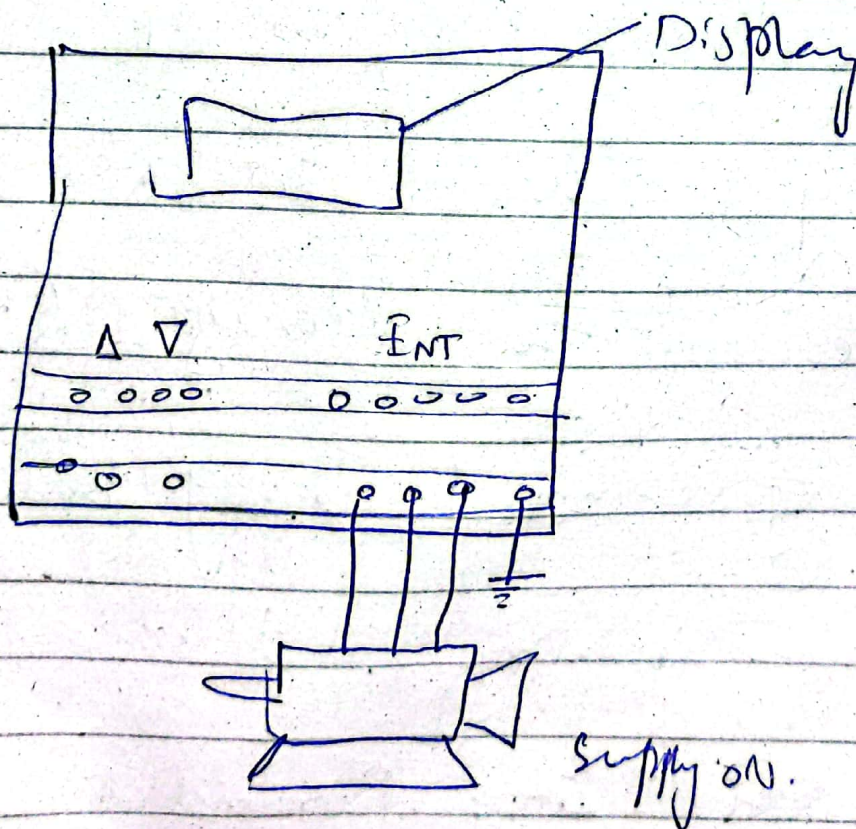
firstly press stop switch then after

that we set. All industrial
programmable devices are set with
the same methods.

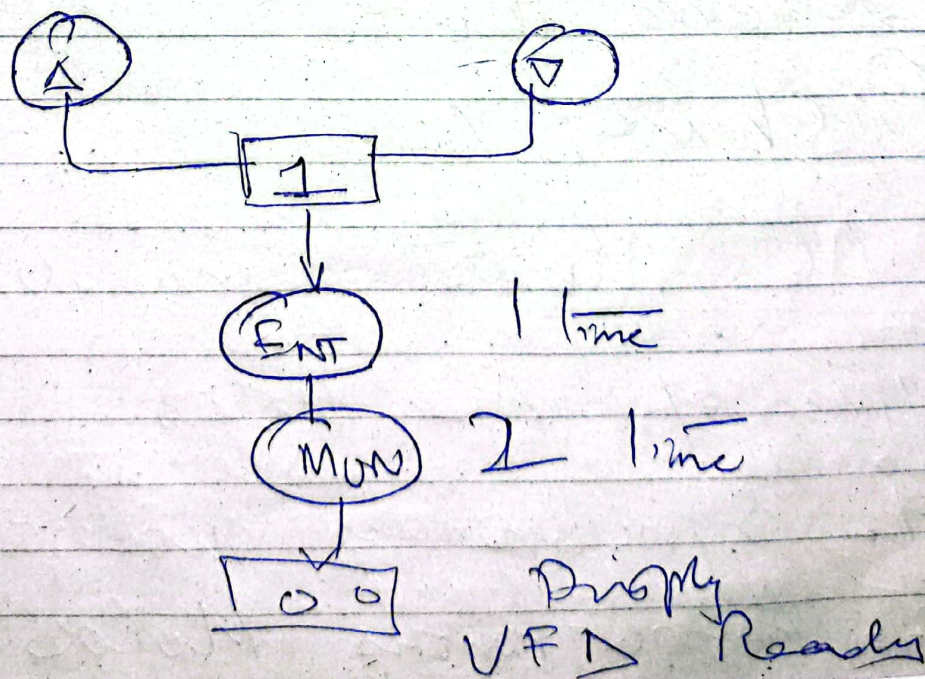
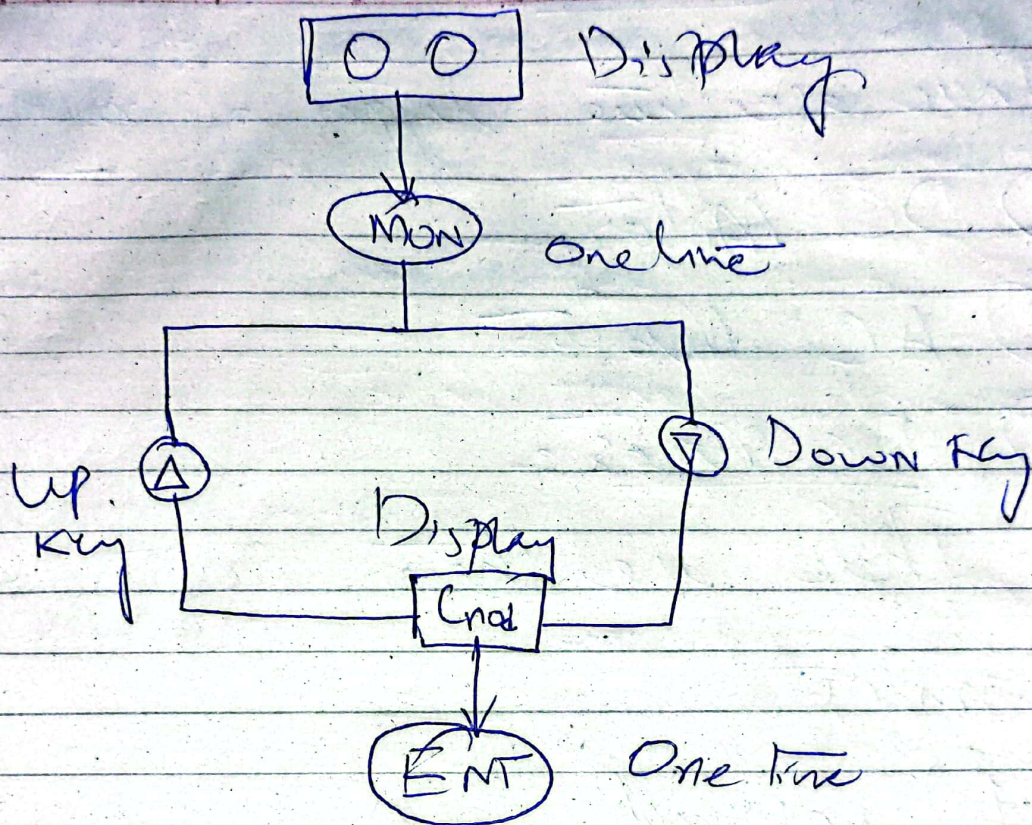
Command selection: Z (noel).

i/ Terminal Block = 0

ii/ Run & Stop Key = 1



PWM



Motors

15/7/2022

There are two types of motor

① DC Motor

② AC Motor

① DC Motors:-

There are three types of DC motor

① Compound Motor

② Series Motor

③ Shunt Motor

② AC Motor There are two

types of AC motor.

1. Synchronous motor

2. Asynchronous Motor

i) Synchronous motor There are two types of synchronous motor

1. Plain motor

2. Super Motor

These two motors are used on HEAVY LOAD on industry.

ii) Asynchronous motor:-

There are many types of Asynchronous motors.

① Induction motor

② Commutator

③ Squarrel cage

④ Servo motor

These motors have stator is of same type. It has ^{difference in} ~~same~~ shape type of rotor and in recent machines have these two types of motor equipped mostly.

① Induction motor

② Servo motor

Induction motor

Induction motor are used in industrial machines and applications. They are from 0.2 HP to 500 HP in industry. They are majorly used in industry.

- 1) Power house, 2) Generator.
- 3) Compressor 4) Chiller 5) R.O plant.
- 6) Boilers 7) Heat recovery plant
- 8) HVAC 9) Humidification plant.

Parts of Induction Motor

- 1) Starter (Body)
- 2) Rotor
- 3) Bearing
- 4) Motor covers.
- 5) Terminal box
- 6) Foundation
- 7) Back fan
- 8) Back fan cover
- 9) Sir clip
- 10) Counter pin

In Gear boxes and on heavy pumps Flusher type motors are used. The rotor of motor have bearing on both sides and they are of two types

1) ZZ series and C3 series.

The change of bearing is included in the overhauling and maintenance of machines. ZZ series starts from 6200 series where as C3 Series starts from 6300 and they are called ball bearings. In these two bearings have

basically change in inner dia.
To hold the bearing in shaft
and in motor cover housing is have
installed / provision of Sirclips. Bear-
ing have built-in grease which
helps in the rotation. Bearing life
is not depend upon Number
of days. But it depend upon
rotation and time. Bearing always
installed according to the weight
in the equipment.

LOSSES OF INDUCTION MOTOR

- 1- Iron Loss (due to motor and core)
- 2- Copper losses (arise due to winding)
3. Friction loss (due to friction f_r)

④ Eddy current loss (due to heat)

-: Formula of Motor speed :-

If motor has two pole then
the rpm of motor 750
rpm.

$$N = \frac{120 F}{P}$$

$N =$ speed
Angle = 120

$F = \text{frequency}$, Pole = P

The winding of motor divide in the parts / sections these are called its poles. This formula is used to find the speed and pole of the motor.

$$2 \text{ pole} = 3000 \text{ (2800-2920)}$$

$$4 \text{ pole} = 1500 \text{ (1400-1460)}$$

Q. If motor have two pole find its rpm.

$$N = \frac{120 \times 60}{P}$$

$$\boxed{N = 3000} \text{ rpm.}$$

Motor of 750 rpm find its
pole?

$$P = \frac{120 \times 50}{750}$$

Name plates of motor

HT MOTORS majorly used in industry for crushing. It has high voltage and low current. These motor are from 10.1 HT till 11000 V

It has running ampere ^{in between} 25 to ~~30~~ 30 Amp for These motor HT.

transformer and HT motors.

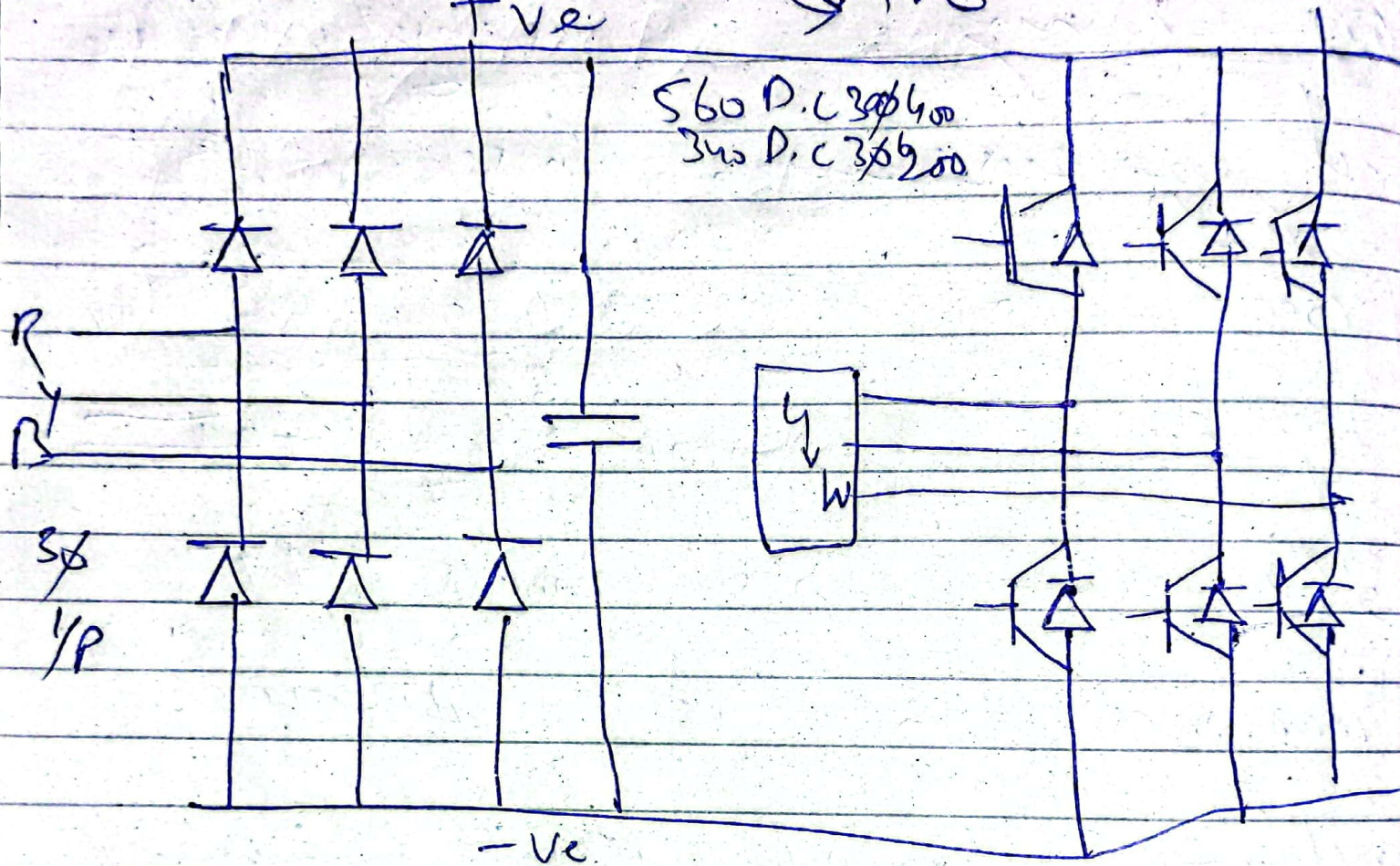
and its control circuit were

made. In these circuit PT

and COT plays vital role.

Schematic diagram of VFD.

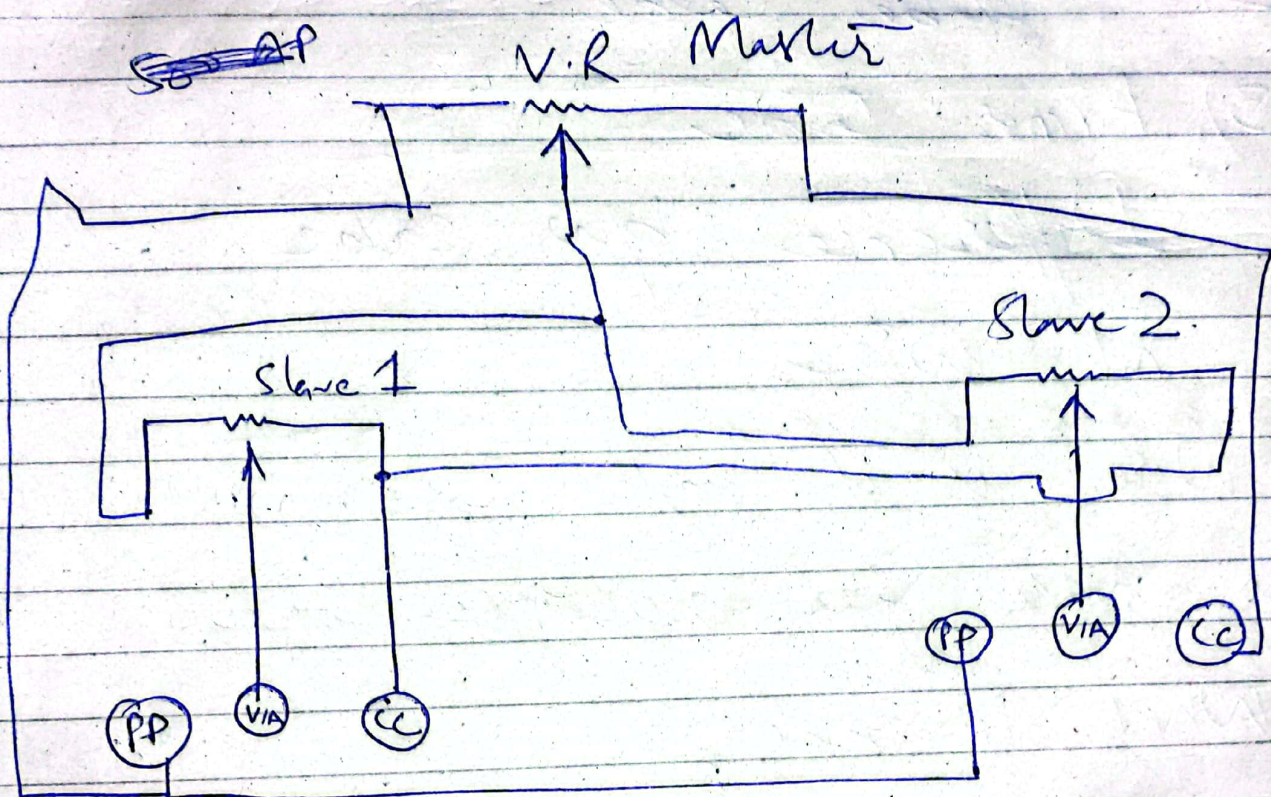
IGBT A.C.T.O.D.O.L
T.V.e
P.A.C
A.C



$$\frac{120 \times 3}{120}$$

$$N = \frac{120F}{P}$$

Q If we have to set motor at 800 rpm. So at what Hertz we have to set VFD.



Tension Control Synchronizing
connection with Master VR
and Slave VR

27/7/2022

Cables

Types of cables

- 1) PVC / PVC/PVC cable (std cable)
- 2) Flexible cable
- 3) Armor cable

Difference b/w cable and wire

Wire is of single core where as cable for multiple core.

What is cable?

Cable is comprise of more than one core and ^{means} ~~the~~ to

transfer electricity from one

place to another. The cable have conductors on which insulator layer is covered for its protection. The std cable and flexible cables are from 1.5 mm^2 to 630 mm^2

Other than that cables are also made on order. In Industry after above 185 mm^2 cable we use flexible single lead cable. The cables are standard 3 core and 4 core.

Where as in flexible cable single conductor cable, control cable, shielded cable, heat proof cable and multi

Core cables are also included. Armored
cable are also 3.5 core and 4 core
available

SIZE OF CABLE STD. CABLE

<u>Size</u>	<u>Amp</u>
105 mm ²	8 A
2.5	12-15 A
4	25
6	30
10	40
16	50
25	80
35	100
50	125
70	150
95	200
120	240
150	275
185	300

240
300

350
400

In Pakistan cables are manufactured

- 1) Pakistan Cables
- 2) AEL company cables
- 3) Pioneer cables

Single lead cable (Flexible)

200 mm

240

300

350

400

500

650 mm

300

350

400

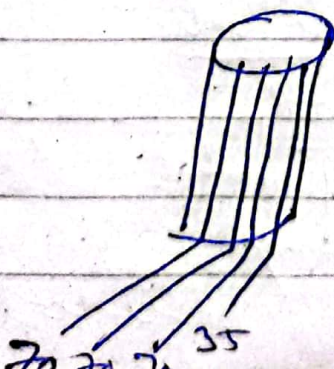
450

500

600

700

Difference b/w 3.5 core and 4 core



The size of core is same as the size of cable in standard cables

Method to find out size of cable

To find out the size of cable we have 0-25mm vernier method or Vernier Caliper. The size of cable always find out from formula.

$$\frac{d^2 \times \pi}{4}$$

CHOICE OF CABLE

The supply of industry is depend upon the cable and whole

company load is on the
cables. ~~Any time in the~~
~~industry~~ whenever the cable procure
in the industry or choose then
its how much its insulation bare
the voltage. And how much
current it can tolerate. In ^{Industry} ~~Industry~~
cable always use at 70% from
given current or rated current.

And industry when we purchase
the cable in bulk quantity then along
with it INVOICE always come.

On this INVOICE the cable size,

Voltage drop and current drop
is mention on its length so that
keep in mind this cable is installed.
And this INVOICE is keep safely for
reference. Cable are always
connected along with the
lux. And cable and lux should
have same size lux always punch
with lux Punch. Lux should not
be loose in the in the cable.
And during buying the cable
price and current both are
keep in mind carefully. Do not take

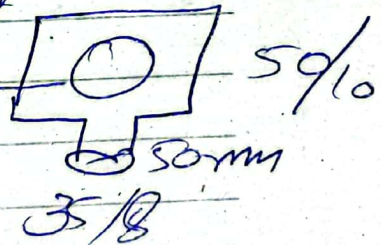
risk in cable buying i.e cable is flexible or standard always install according to its application.

Q Tell the size of cable
Hint : current is given/provided.

Similarly by telling the size of the cable current is asked. Mostly

the Questions are from 25 mm^2 to 35 mm^2 .

Nut bolt



Note:-

Those motors or any type of load whose torque is Δ ltering or torque time large than cable cable is always use as of

Coreque time

- 2) Always protect cable from sunlight.
- 3) ~~Donot~~ Minimize the joints in cables
- 4) Donot run the cable near the hot/heat ~~place~~, ~~means~~ flameable gases and chemicals places.
- 5) During cable installation the route of cable tray should be minimum.
- 6) In some application or need

Cables are also placed underground or overhead.

7) During cable connection no point are loose. ~~in the~~

8) On every cable core tape the Red, Yellow and Blue place the tag.

9) If there is more cable on bracket terminal then place the insulation between them. and the cables lie.

10) Cables are always used according to its application and according to the current.

VOLTAGE DROP

IN CABLE

On Pakistan cable invoice 2.6 mV voltage drop are mention, ~~on~~

so on total length milli volt are find out by this formula.

$$V_d = mV \times L \times L \div 1000$$

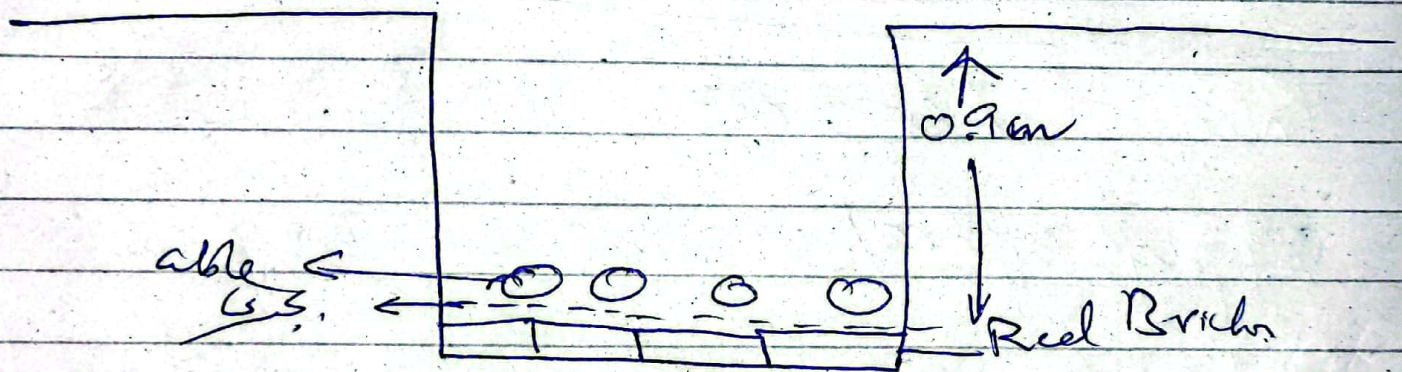
If cable is of 16 mm x 50 mtr

$$= \frac{2.6 \times 50 \times 50}{1000}$$

$$\boxed{V_d = 6.5}$$

Armor Cables

Armor cables are installed under ground and no other type of cable is used underground.



depth = 90 cm (0.9 m) (International Standard)

If there is heavy traffic on their cement pipe were used. The wire of aluminium on its outer surface of cables are used to protect

it from mechanical risk and
for earth. These type of cables
mostly used by KESC and it starts
from 25 mm^2 .

Standard cable

These cables were used for
supply of m/c from LT panel.
and for supply of motor.
and for lightification supply.

Flexible cable

Flexible cables are of many types.
These are also used for the
supply of m/c.

and for the motor of the m/c.
Flexible cables are used on power
and control cables. Flexible ^{control} cables
are from 0.5 mm^2 till 2.5 mm^2
single core are also available.
Similarly for 3 ϕ supply single
core flexible cables are available on
every size. Flexible multicore cables
are from two core to 100 core
available. On multicore cable num-
bering were also present. Further more,
in industrial m/c panel single core
flexible wire of black color is

90% used. On field devices,
electronic controllers, Flow switches,
measuring devices — multicon
shielded wire is used. In this
cable both side earth
is also installed. Heat proof
wire is used on the m/c's where
thermo couple and PT 100 thermocouple
used.

07/09/2022

PANEL OF MACHINES

There are two types of Panel of machines,

- 1) Operating and Controlling Panel
- 2) Main Panel.

In big machines and plant there are two panels.

~~1)~~ Operating panel and Main panel

- 1) Operating/controlling Panel:-

Operating panels are placed beside the machine and on some machines placed alongside with body where the operator ON and OFF the switch

In operating panel switches,
selector switch, variable resistors,
voltmeter, ammeter, lamp
controllers, rpm meter, indication
lamp were placed. From
main panel multicore or control
cable - the connection of control
wires were done on which the
numbering was compulsory done on
the ^{control} wires and connectors which
are similarly mentioned in the diagram.
Main panel were placed near the
machine in the room.

On panel room front side
the glasses were compulsory provided
so that during trouble shooting the
behaviour of machine must be visible.

And the temp of panel room must be
 24°C whether there is AC present or
not. Panel room must have AC..

On main panel separate cabinets
for DC drive, VFD, PLC,
Contactors, relay, Breakers, Fuses.

On ~~these panel~~ the bottom of these
cabinets the connectors were present
which use to join the internal and

external wiring. Every wire has its numbers. Similarly every connectors also have numbers.

That's why trouble shooting and fault tracing always done on the connectors and with the help of diagram wires were traced.

So, As per address from Main panel motor were connected through cable tray and all field SGs of the m/c were wired. And this cable tray must be covered. On some machines

(small machines) the panel which are attached with machine these are same of both control and power panel. Through cable tray especially in EMER sector mouse were come into the panel and eat the control cable. So, that, why mouse fumigation is also our responsibility. Any of the machine panel is not allowed any person to touch or open it other than Electrical person, And in some cases lock and key is also the practice.

JOINTS OF CABLE

whether it is erection or any time, always install the cable by measuring and it is our maximum struggle that there will be no joints in the cable. There will be available a/c. to the size of the kit in the market. In this kit, Fely ampere tape and high insulation tape given to joint the cables.

LT Panel 09.09.2022

Any industry LT panel is installed during erection days according to its connecting load means made according to total load. The room which is made for LT panel is called LT room. LT room has 3 panels

① LT panel

② PF Panel

③ Lighting panel.

Whether its is GMT or PMT supply always come from meter to LT panel. And whole mill/factory supply in different

department supplied through
LT panel. In LT panel
all ~~load~~ ~~and~~ breakers
were fitted according department
load and machines current.
And two to three breakers
were kept as spare. Any
cable which connected from LT
to machine is pass through
underground and overhead cable
tray. LT panel always
~~the~~ ~~according~~ ~~to~~ mount on cable trench.
In front of LT panel floor

rubber / PVC pad must placed.

Inside L.T panel for connection of breakers we always use Bus Bar not cables. Unauthorized

person is not ~~allow~~ allow to go to the LT panel room.

And sweepers are also not allowed.

In LT room other than electrical person only Power House

persons were allowed to enter the room.

In LT room care is taken for

temperature of room. To maintain

the temperature AC or chiller

line is also used. On LT panel breakers the name of the departments were always mention for which PVC tags were always use. And whenever any assistance is required in your life to make P/F or LT Panel we always made it from Mahin. So. In LT panel we must install minimum 01 or maximum 02 KWH meter CT type to consider check the KEIC meter reading or Bills. From LT

panel all cables going to departments their ^{department} names were also mention on the cable. Further more in LT panel sequence phase relay, under voltage, over voltage relay and phase failure relay were also installed. Cable always installed from LT panel or room to machine. And we left 3-4 Meters extra cable for future in the trench during installation. LT panel faults were due to following common reasons.

- ① CABLE heatup
- ② Burring of cable core
- ③ Burring of Breakers.

LIGHTING PANEL

Any industry lighting panel is used to control the lighting circuit or to provide the supply ~~the supply~~ to lighting DB because machine circuit (means supply) don't have any relation or connection with lighting circuit. LT is same

design according to the ~~total~~ load.

It also have breakers like LT

panel. ^{The input supply} lighting panel always come

from LT panel. And every cable

run from lighting panel to DB.

and in this we always use

100A Breaker Maximum

PF Panel

PF panel is just like m/c and on this always service people will work.

Why there is fuse use in PF panel and not Breaker?

$$KVA = 1.8 \times KW$$

PF Panel always ^{best} made and install on half of the total load. P/F Panel is connected parallel beside LT Panel.

* LT Panel design \rightarrow total 4 types
36 is for ① motor ② Drive ③ PF
④ Heater.

means LT Panel and P/F Panel
have Bus Bar.

14/09/2022

PF Controller

PF controllers are of different
companies brands made and best
brand is NOKIN (made in Turkey)
often / many used. (Technology made in Germany)

The setting of parameters of PF
controller ∇ was done by manual
reading A/C to which the most important
parameters were value of CK

① It means CK is the ratio

② of CT.
Upper/lower limit of P/F
ratio which is std. 0.9 - 0.92

③ Stages of opening of power
bank. (It stages always starts from
lower KVAR to higher KVAR)

④ A harm

⑤ voltage

⑥ Delay time setting.

Ex has

* Bus Coupler b/w LT/PF

* Reasons of PF Panel.

Penalty.

- ① Capacitor problem in Bank
- ② CT problem
- ③ Fuse $\ll 1$

Reason of becoming low of Bank
if $PF = 1$

- ① Relay Problem
- ② Contactor Problem.

→ To beke from PF penalty
there is only one way to
Maintain escape good relations
with GM.

The internal wiring of PF is

also done with wire or cable.
and Banks supply is always
done through HRC fuse
and not use the breakers.

Basically, PF controller
is used to ~~step up~~ ON
in sequence / stages the ~~total~~ ^{Banks}
(capacitors) automatically step
by step and in case lowering
load step by step ^{OFF of Banks} is also
automatically done by PF controller.

PF controller is working / dependent
on CT. It work through Δ .

Along with this is PF, manual control system - is also design it in case CT & controller & contactor, become faulty. This is temporary solution to ON and OFF the

P/F banks manually by observing load. If PF is less the O.G then KE will charge.

Penalty on bill which will be in lacks and due to some malfunctions

if PF is 1 and run for it means that P/F bank have become load and due to which current will

Continue more and then will be
charges in Bill. In the P/F
banks there are small small
capacitor (not in oil type
capacitor) which are connected
in star/delta PF
Bank are from 6.5 KVAR
to 100 KVAR used.

8 What is Power P/F factor?

Along ^{side} with balancing of voltage
and current it also
eliminate reactance. ~~And~~ is
Because

PF I — Power Factor Improvement
LBS — load Breaker switch

can industry have these three type of load and when electricity return after these three in return with reactance which is also called IMPEDANCE. Due to impedance there will be synchroscopic wave from generator harmonics. Due to which there is ^{distortion} ~~this~~ ~~reactance~~ in wave form which ^(25% - 17%) wave form in result current and voltage become unbalance so P/F bank work as filter in Electricity to

STAGES Q5

filter distortion.

1) Industrial Automation and control system.

2) Instrumentation with Switching devices and controllers.

In industry and all operations and plant automation and synchronizing system used all switching devices, programming devices and components, sensors To complete any logic sensor are used. where as sensor

itself is instrument and all instruments and controllers and devices work on different logic to complete the process in the modern machines.

According to logic, instrument complete the process step by step automatically. It provide display and also are programmable or hard fixed program and also some are analog. These all sensor which are used with instrument controller

NPN & PNP are switching control
Negative.

devices are basically divide
into two sections (means
sensor are of two types.

- 1) Sensor Switching
- 2) Measuring sensor.

1) Switching sensor.

Switching sensors are of two
types and (a) NPN (b) PNP
and some are of options

having both NPN & PNP. Switching
sensors perform very quick switching
and some are design to perform
slow switching. The selection of

sensor depend upon the process.
Whole machine automation ^{control} system
also depend upon negative and
also on positive switching. For this
every sensor we have to under-
stand the PNP and NPN.
And every sensor have its
specification that placed.
And diode symbol/sign is
drawn. Switching sensor are
used for different position,
different application and different
movement & that to control.

the process automatically.
Sensors are placed placed
~~across~~ at specific distance
from the ^{sensing} object. Sensor
distance are of 5mm and
on some ^{sensors} to increase and
decrease the distance ^{sensors} also
equipped with VR to control the
distance. Switching sensor also
equipped with LED which open
on Open the sensor. Some common
used sensors of industry are
as followi.

- 1) Proximity sensor
- 2) Color Mark sensor
- 3) Metal sensor
- 4) Fabric sensor
- 5) Photo optical sensor
- 6) Capacitive sensor
- 7) Switching sensor.

These all sensor have state NO and NC and both and these all sensor perform switching on 24V DC. The sensor and controller should be of same family.

Alongside with controller, these sensors are also used as separately means also used in control circuit. Switching sensor not check on 220 (DC/AC). Sensors should be checked on 24VDC power supply and also (always) under load. And must check the output voltage with negative and not trust simply on its indication means counter check. These sensors which are doing switching on 220 V are working

as limit switching and its state is always NC and its voltage is always mentioned. In Industrial m/c's and plants to control automation, to control the process, to control the movement we use sensor. Movement also obtain from air pressure and majority movement are done by pneumatic movement. And complete process is controlled by solenoid valves. These all sensors are in MM size. Its body have long thread provided for mechanical fitting and adjusting its

position, it ^{have} also chuck nut to
safe it from vibration.

Measuring Sensor 19/09/2022

There are three types of
measuring sensors used in the
industry

i) PT 100 ii) Thermo couple
iii) RTD

These all three sensors have
relation with temperature. Basically

these all three sensors work
on analog signal. Means its
output are on analog signal.

and selection of sensor depend upon temperature. A/c to the material it has differences. That's why a/c to this these errors have differences.

Basically there are three types of analogue signals.

- 1) Resistance
- 2) Milli ampere
- 3) Milli Volt.

Digital signals are of

i) Pulse form

ii) 01 - 10 form. 3

Q7 In Interview Questions come to define these three sensors that the Answer is that these 03 sensors (step by step) gradually increase or decrease the temperature.

ii) PT 100

PT 100 = 0 - 400°C

In any industry PT 100 used 90% in the industry. To use control the ⁽⁺⁾ temperature.

These are mostly installed at the at the bottom machines, chemical boxes.

Control means = ON/OFF

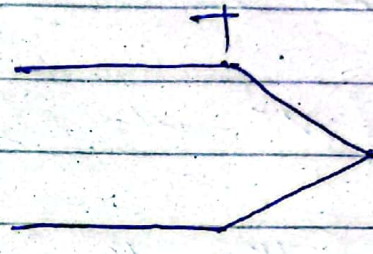
It works along with controller.

And controller is same as its

PT 100. PT 100 in diagram shown

by Ω .

iii) Thermo couple:



Thermo couple and RTD

are both shown with same

symbol. and both are recognize by

its name. Thermo couple are of

different types means according

to its temperature. In Industrial

ms. Chemicals, boilers, and

furnance temperature is different.

that's why it is used according to its type.

S-type = $0 - 600^{\circ}\text{C}$

K-type = $0 - 800^{\circ}\text{C}$

J-type = $0 - 1200^{\circ}\text{C}$

N-type = $0 - 2200^{\circ}\text{C}$

In industrial m/cs mostly K-type thermocouple is used.

Q. Why there are $2W$, $3W$ and $4W$ in thermocouple and RTD?

It is because that they work on more accuracy. In these one is (+) and other is (-). and (+) always Red and (-) is always blue. It always works along with its own controller family.

ii) RTD :-

RTD is used in (-) ~~temp~~ temperature. Where as used as for (+) temperature because its value is $-60^{\circ}\text{C} - +1999^{\circ}\text{C}$.

CONTROLLERS :-

For these all measuring sensors in industrial m/cs and plant temperature controller are used. These controller work according to its sensor. Whether it is analog or digital controller its value display in 3 digits. It also provide switching. Every controller of temperature logic works for example milli Ampere, milli volt or resistance and it also ^{and set} program accordingly.

during &
h

Any setting or programming the sensor should be connect with controller. ^{means} It is not program until we not connect the sensors. Some controller who support K-type not support J-type and some controller support all types. Those are set according to its type. and jumpers also connected to do this.

Note:- Whenever you job in any industry at any level you

should have knowledge of set temperatures of m/c and plant. ~~Any~~ A switching which is obtained from controller, through ^{this} switching we control electrical control circuit, motor and valves.

21/09/2022

PT - 100 means platinum temperature. To check PT - 100 it always ^{above} show ≥ 100 and if less than 100 that means it is faulty. Similarly RTD and other sensors.

are also show shrink valve.

and it emit millivolt and milliamper on output.

Pressure

Pressure plays an important role in industrial m/c's synchronizing system and automation. To obtain mechanical movement as alternate or second to motor pressure is used. Pressure is obtain from two sources.

1) Pneumatic Pressure

2) Hydraulic Pressure

Pneumatic pressure obtain from
air. where as hydraulic pressure
obtain from Oil. To
get air pressure compressors
and to get hydraulic pressure
hydraulic oil tanks are used in industry.

In any industry compressors
were commonly used. Where
as separate hydraulic system
is placed at individual m/c.

Pressure are of two types
piston type and screw type.

Air pressure is called pneumatic

control pressure and oil
pressure system called hydraulic
control pressure system. In industrial
mills and plant where low
pressure is applied pneumatic pressure
system is installed whereas for high
pressure system hydraulic system is used.
Basically to obtain work from
both system solenoid valves and
cylinders were used. Pneumatic
system is part of utility system.
where as hydraulic pressure is a
part of machines. By using

Solenoid valves and cylinder along with timing control, linear movement, upward, down, lateral, pushing and stopping, holding or linear movement of shaft is obtained.

In any industry to control the automation ~~of~~ coils were used.

1) Transformer coil.

2) Motor coil.

3) Contactor coil.

4) Relay coil.

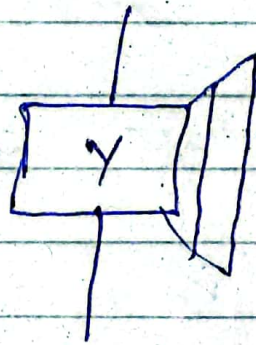
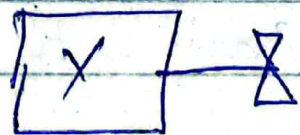
5) Solenoid coil.

6) Brake coil.

Solenoid valve and Cylinder

These two are in pair and both don't work in separate

In diagram the name of solenoid valve is Y and its symbol is



Brake
Coil.

So in industry 05 types of solenoid valves are used means in 5 types of flow line ^{is in use} used/instead and all 05 types of valves have coil and at the back

separate mechanical filling for each is provided. Same code and symbol is used in the diagram. whether it is of

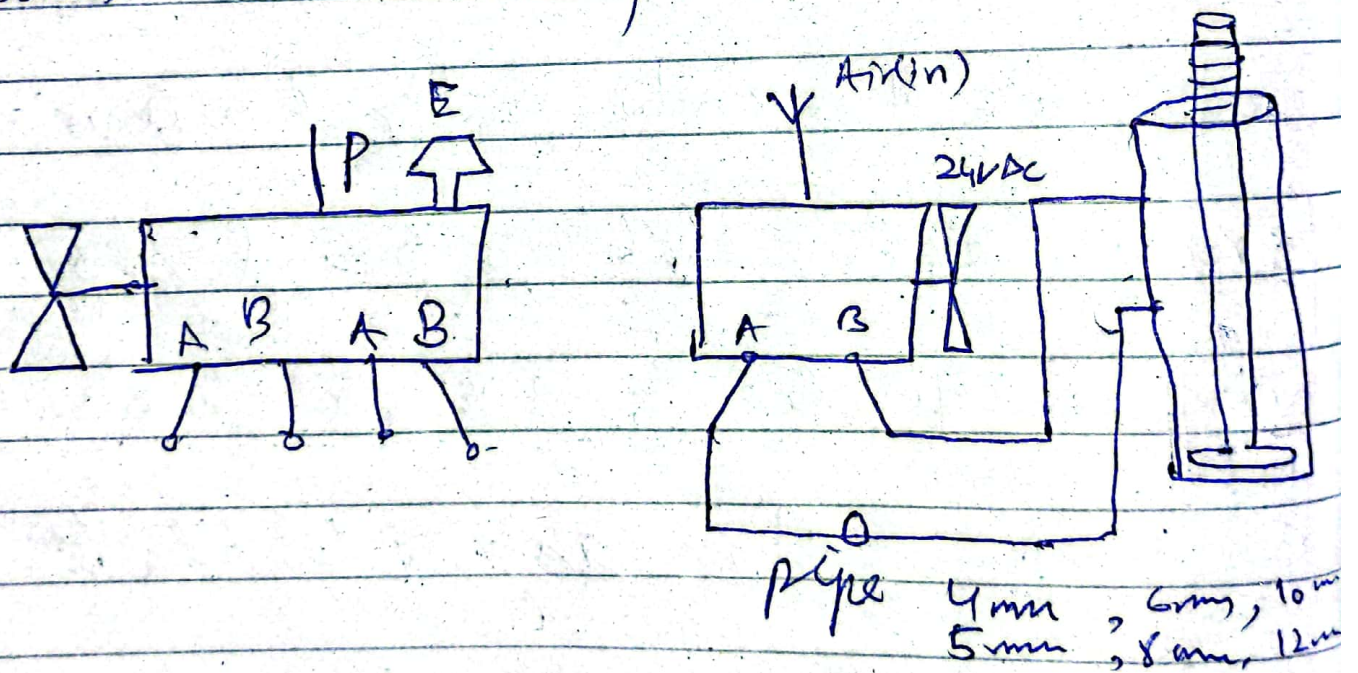
i) Air ii) Oil iii) Gas.

iv) Water v) Steam.

Solenoid in any line is used to control the flow of along with timing ~~control~~ ~~are used~~ to control the system. The coil which is attached with solenoid valve has same voltage as of control circuit voltage.

Solenoid valve also have LED
through which we can recognize the
~~valve of the~~ ON/OFF of the
system. To provide the supply of
solenoid valves holders were used
and its screw is always tight.
Solenoid valve also are in single coil
or in double coil. Solenoid valve
operate the shaft up and down
through cylinder, which is also called
ACTUATOR. In any plant the
mechanical movement is obtain by
placing the at any required angle

On some cylinder ~~the~~ fittings sensors were also placed. These sensors are called READ switch which measure and control the position of actuator. Mostly SMC brand pneumatic solenoid valves used in companies.



Diagram

Note :- If in industry the pneumatic system is our responsibility so on those machines where ~~pneumatic~~ solenoid valves were placed on hubs so there INLET and Outlet pipes should placed with proper marking Numbers.

Similar marking process will be done on hydraulic system.

The pipes of hydraulic system were silver coated and silver wire gauge and not fitted by

its pipe. In hydraulic
links frequent problem were
on the rotation of motor
which means change of rotation
results in not coming of
pressure in system.

(SSR) Solid State Relay

SSR especially use to control
the heater and in packages
industry, all heaters which were
used SSR were placed.
Contactor produce flashing or load
that's why SSR were used

to protect from fire.

SSR are thyristor control and don't have coil. It works from 0 to 30 volt and ^{done power} switching ~~on power~~. SSR are of 1ϕ and 3ϕ available. Through these supply is provided to heaters.

Heater :-

In packages industry heaters are of two types

- 1) Wire wound
- 2) Assembly wound.

Super Steam - steam without moisture.

Top Assembly type heaters were present. Assembly type heaters are of different kW - and with its shape and type recognize by different names.

Heaters on machine in process is used to heat the product and seal the product. means where

product is packed in plastic there heater is present. on some m/c

for safety of heaters some

lines of chillers were also

present. Heaters are also check

from series board and with
meter. It will show continuity.

On open means faulty. In packages

Industry heaters were fit on

aluminum block and fitted in Jack.

which are moving from forward and

back ward by help of solenoid valves

and cylinders.

(diagram)

Measurement Automation
↳ timing and counter

Counter Meter

Counter Meter are both
analogue or digital
(measurement principle Kg,
Number of Pc, length).

Analogue counter meters are
used in mps. which are
fit on the roll of final
mps. where digital meter
~~is~~ every mls of the world were

used. (Digital Counter Meter)

DCM are also of high
and slow / low speed.

and along with it the sensor of same family were used.

Sensor are always used at the appropriate distance. Basically

DLM work on two principles.

1) Pulse Input.

2) Binary Logic 01, 10

Some counter meters were

dip switch controller and programmable. DLM not set

without reading the manual. For

this sensor is must connected

From sensor the switching is
always use for control circuit
Means through switching circuit
machine is stop and
obtain indication. DCM has on
set value and another preset
value by own self. and on
preset value counter is stop.
which run on display.

LEVEL CONTROLLER

In industrial m/c any required
level is control or maintain by
level controllers. LC are with

electrode controller and magnetic
sump also find but 95%.
electrode controller were
used. In Industries where products
are in liquid their liquid
level is must maintain otherwise
the quantity of liquid will suffer.
Level controllers plays a vital
role in the M/c. Because through
level controller's switching the solenoid
valve and motor is controlled.
Level controller mostly used electrode
installed. But where flammable

is used magnetic sensors level
controller were used. It plays
prominent role in automation of
m/c. These are also of fix program.
These electrode are of SS used
with controller are installed
with holder fitting on m/c.

level controller

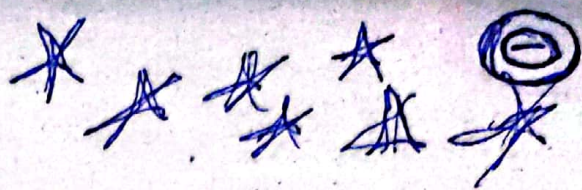
(HLC-300)

Counter meter analog and
digital.

OMRON Type 61F-11

61F-62 TDL2

28/09/2022



Practical 2 (Temp controller)

Temperature controllers were used in plant and m/c to control the heat of. These are of different companies. But mostly autone brand is used. Temp controllers are also analogue or in digital. Analogue are of dial control where as digital are of programming type. The parameter of digital temp controllers were done by reading the manual. In these also have set value

and preset value set value
means required temperature
which is set on the m/c.

The preset value ^{on} which the
controller works. For setting the

sensor should always connected

with the controller. Through its

(sensor) switching solenoid valve is

controlled. Whether it is steam

or gas PT-100, RTD or

thermocouple placing option is

given. On which controller were

set.

Note

Whether you job on industry
you should know the temperature
setting values of the m/cs working
in the Plants.

07/10/2022

Method = Power
circuit

PLC

Programmable Logic Controller

Note

PLC is a programmable

switching device. or an

controlling instrument. ~~PLC~~ PLC

is also control through WLC

means PLC is dependent of

WLC. The whole control system

of PLC is programmed through

computer technology, or made up

of. means without computer

we cannot work on PLC or

PLC cannot work without computer

Logic = control circuit

Before working on PLC, you should have grip on WLC and computer.

Note (Sub Note)

To get expert in PLC you should have expert of 07 things.

1. English should be good.

2. Mathematics 4 4

3) Computer 11 11

4) Command on WLC

5) He/she should be clear to

6) He should be aware of all

symbols and codes.

7)

In PLC according to switching normal type applications where as relay base communication base type is there. Communication base type is transistor bases.

Basically there are four sections working in PLC.

- 1) Computer / Laptop
- 2) CPU
- 3) Input Module.
- 4) Output Module.

PLC is also called sequence because output is delivered

with timing and doing
process step by step.

1) CPU

In every PLC have CPU
some have built-in and some
have ANALOG. means RELAY
base PLC called and COMPACT
PLC is one in which CPU is
with input and output module.

Where as transistor base PLC
is called Large PLC and
this is also in compact and
its parts are also in separate available.

and on the basis of requirement more accessories are also installed.

CPU is the primary part of any PLC. The IC of PLC is called CHIP CONTROLLER. CPU work as brain.

in any PLC where any logic or program and control circuit is save in its memory. It has

also relation with input and output control devices. PLC

On the basis of logic, performs automatically from

input till output. And
It work on 100% on the program
which is save in its memory.

Laptop

To program PLC, to define
logic in PLC or to make control
circuit in PLC laptop is

necessary requirement. And in this
laptop program is always made
according to the software means

in laptop. The program is always made
with the help of software. If there
is no software on laptop so no
program is made.

On the basis of model and make different softwares are available. Means every PLC have distinct program whether if the PLCs have identical brands. Means softwares are different which do not support each other. Two types of cables are used to deliver the program in the memory for saving in PLC.

1) RS-232 2) RS-485

On both sides of cable connector were given some have (DB-9

connector) and some have (USB connection). On one side laptop is connected and on the other side PLC is connected. Whether it is any brand of PLC cables are different every cable is different but all are called these two ~~names~~ names. PLC perform ^{all to} program which is save in its memory. Because program is also of input and of output. To find the fault (PLC based) m/c and trouble shooting laptop is required. Through laptop

m/c's faults were trace and
minimum time required to trace
the fault through PLC.

10/10/2022

Input Module

Input module is related
to input contact devices. In which
m/c installed sensor, switches,
devices and all installed to the
input module ^{connected} on terminal. A/c to
diagram every wire have address
and ^{terminal} number is written. Input
module ~~AA~~ works on input signal.

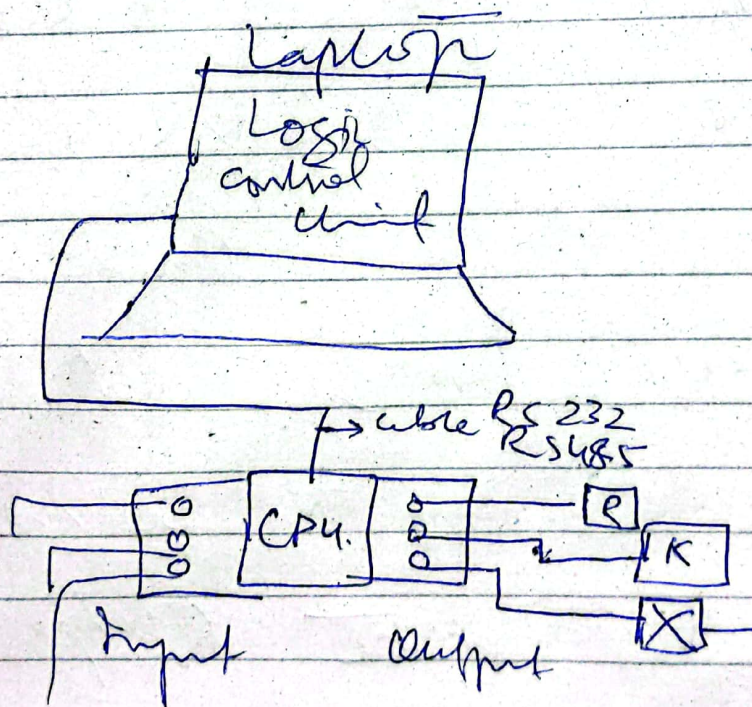
means the program we feed in
then CPU will command on
same input.

Output Module :-

Output module is related to
Output control devices. It ~~energ~~
energizes, operate like relays,
Contractors, solenoid valves, ^{limit} switches,
sensors, act, indication lamps
of whole m/c and field
devices. And its wires are
connected on the Output module
and terminal address and numbers

is placed on each wire. ALU
to diagram the input signals
comes in the CPU and ~~add~~ ALU to
it it generate output signals.
Similarly, providing timing the
whole process is carried out as

Working



Note
It must be remembered
that PLC work on Digital
signals. That's why if machine
have analogue signals then we have
to add Analogue module. Analogue
module are of input and output
and ^{compact} PLC have built-in.

12/10/2022

Analogue Module:-

Analogue module are used
because of analogue modules.

Basically analogue module is
used to convert analogue signals

into digital signals than send command to the CPU. Analogue module are of three types

a) Millivolt b) Resistance, c) Millampere

Similarly all these three signals have separate modules, which are recognized by its types.

Along with these combine analogue signals is also available. But we

have to set to its signals. To

use analogue signals, analogue resistors were used. which

are related and have connection with

memory. The ~~signals of~~ output and input side analogue model are separate founds.

SIZE OF PLC

- 1) Mini PLC
- 2) Medium PLC
- 3) LARGE PLC

Other than that LOGO PLC is also available. In all these PLC there is a difference of storage memory. Other than these in large and medium PLC have provision of fitting analogue

module. PLC always purchase and installed d/c to its (I/Os) Input and outputs. Furthermore, on the basis of need separate input and output modules were also installed in PLC language input output were called (I/Os).

Types of PLC

There are two types of PLC.

- 1) Relay type
- 2) Transistor type.

As compared to relay type PLC

transistor type PLC is much

more faster ^{switching} than relay PLC.

Relay type PLC is available in compact version and small and simple used in simple m/c's. Whereas

transistor type PLC is used in communication system, DCS,

Scada system. Analogue modules were used in both Relay type and

transistor type PLC. Relay type PLC and transistor type PLC both

were ~~used~~ recognize by its serial no and type in relay type PLC.

here MCR ^{written} before its serial no.

where as transistor type PLC
are of two types NPN and
PNP. In NPN PLC, TC
is written where as in PNP,
TJ is written in serial no.

Whether it is of any
type of Electronic device
or controller to understand
it we have to recognize to
read its model number and number.

PLC have many brands and machines
equipped with its different brands of
PLC.

There are two principle of PLC diagram means whenever we install PLC than we have our self with diagram always.

2) To get the complete sequence of m/c from operate then after word we ^{are able to} made the programs.

PLC have different brands.

- 1) Siemens
- 2) Beckhoff
- 3) Direct logic
- 4) Allen bratley
- 5) G-fanods

6) Omron

7) Mitsubishi

8) Fatch

9) Delta

10) LS LG (X. we never install)

Whenever we do job in any Industry
as an Engineer ^{we} must have save program
of PLC in back whether there are
plc of different make and
model.

To get good command on
PLC, to succeed in interview to
get expert in PLC control circuit

we must read the manual of PLC along with 6 things that earlier mentioned 7th one is instruction manual. Without reading manual we cannot work on PLC. Along with instruction manual every PLC have Hardware manual to which we have to must understand this also. Because on hardware manual, terminal address, serial no, model no, connections and interface can be understood easily. Where as instruction manual

provide ^{details} information about all I/Os and addresses. Software is also defined and other than that for new learner small programs were also given for easily understanding.

PLC languages.

Five methods are used to work or make program on PLC. These are also called method

- 1) Ladder logic
- 2) PPL (Popular Program language)

3) STL (Structure text language)

4) GL (Graphic language)

5) FBD (Function block diagram)

Programmer convert the program into ladder logic for ease of end user so in this way

90% m/c program were built in logic so that end user trouble shooting should be easier.

LADDER LOGIC

To make ladder logic we must understand the key

and addresses of the software.

Similarly all Command and addresses should also be in mind. Similarly

all tool bars of software must be understood. Approximately in all

softwares all the command, addresses

and tool bars are same. There is

difference in I/Os of PLC

alphabet address. Means the

terminal addresses are different.

The two type are standard.

The meaning of logic ladder

is of ladder that's why the

Ladder diagram is always built in vertical. The supply line of ladder logic diagram starts from L1 and L2. And this is control voltage supply which is 24 V. L1 is +ve and L2 is -ve. That's why between L1 and L2 logic diagram is made. Program were made in compact PLC control power supply is built-in which is of 24 VDC. and we never use built-in power supply. always use external power

supply. TO ON any PLC

we have to supply 110V

and 220V separate power supply

This supply don't have connection
with control circuit.

PLC

P means like ^{the} control circuit

which can perform process step

by step automatically according

to fix program and sequences

The biggest characteristic of PLC

is that without touching the hardware

we can change the sequence

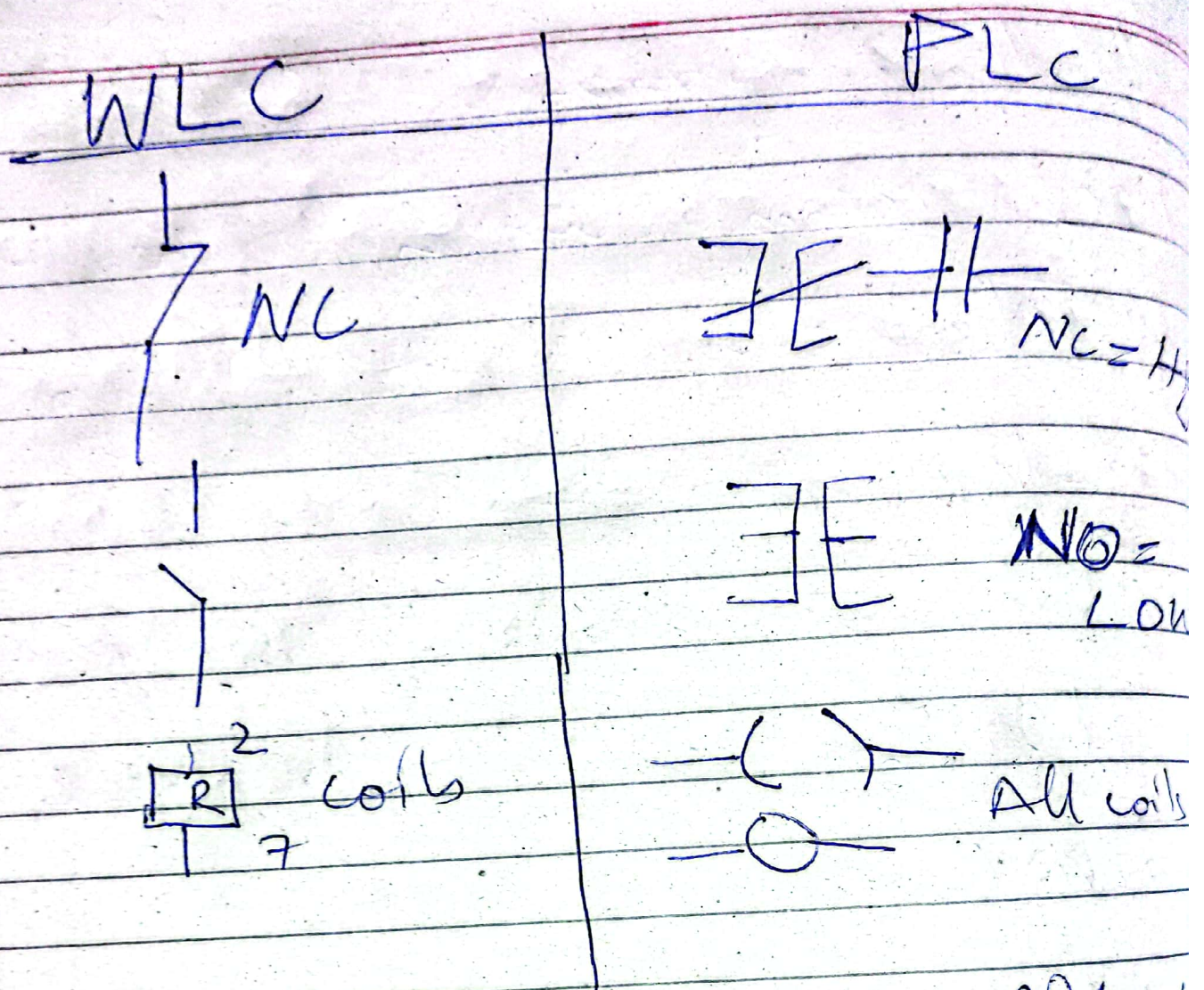
of the programs.

L.C means which is the name of Thinking of human mind.

The logic which is selected to perform the work the thinking which is 100% result provides and correct.

Software command, address key
and Tool bar

In any PLC software there are 03 basic commands.



PLC I/Os shown by different alphabet

I/Os = input = I, X

= Output = Q, Y

And the PLC on which we are working are used as Y and X

In ladder diagram all common
on input side have coil and
all more than one auxiliary were
used by according to the need.

In every PLC timer and contactors
were built in. Similarly, thousands of
relays were built in. The PLC on
which we are working is Fatek model
no FBS 20 Mer 2 and also to

model no the software were
different ^{whether} if the model is same

In this model RS-232 and
RS-485 both were used.

RS-232 cable is used to transfer data from Computer to PLC. where as RS485 along with data transfer can be used to provide display on HMI.

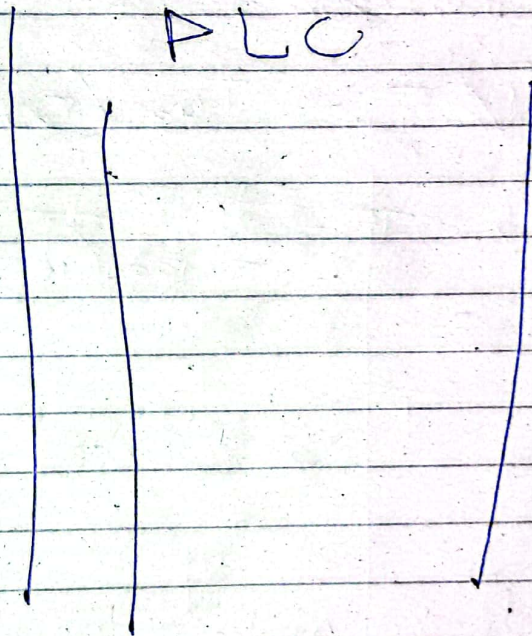
In model no I/Os were total in this PLC 12 i/p and 8 o/p. $X_0 - X_{11}$ (12 input) $Y_0 - Y_7$ (Output) were used.

On PLC command I/Os address were given and on this the name of place is written on it. in this PLC code is

not run software always work
according to I/Os and not recognize
by its name. before switches the
supplies is place before the series

WLC

PLC



17/10/2022

In this PLC we have 256 and these were given separate timing and were divided into

3 categories

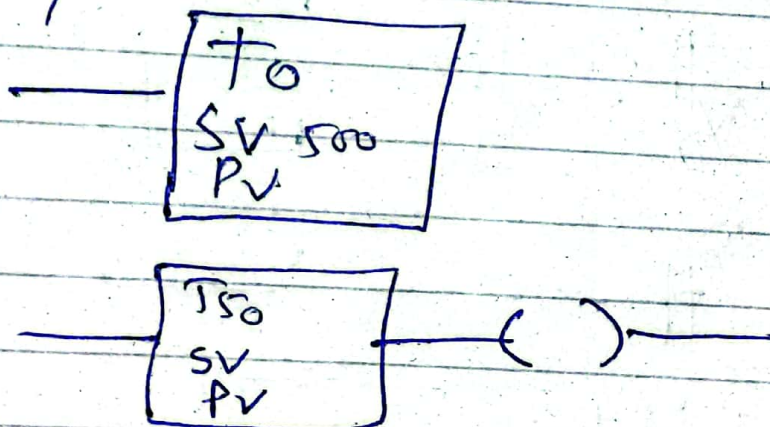
$$\text{i) } T_0 - T_{49} (50) = 0.01 \text{ sec} \\ = 500 = 5 \text{ sec}$$

$$\text{ii) } T_{50} - T_{149} (100) = 0.1 \text{ sec} \\ = 500 = 5 \text{ sec}$$

$$T_{200} - T_{255} \frac{56}{256} = 1 \text{ sec} = 5 \text{ sec}$$

It must be remember timer work on continuous supply. If supply is cut off than it becomes zero.

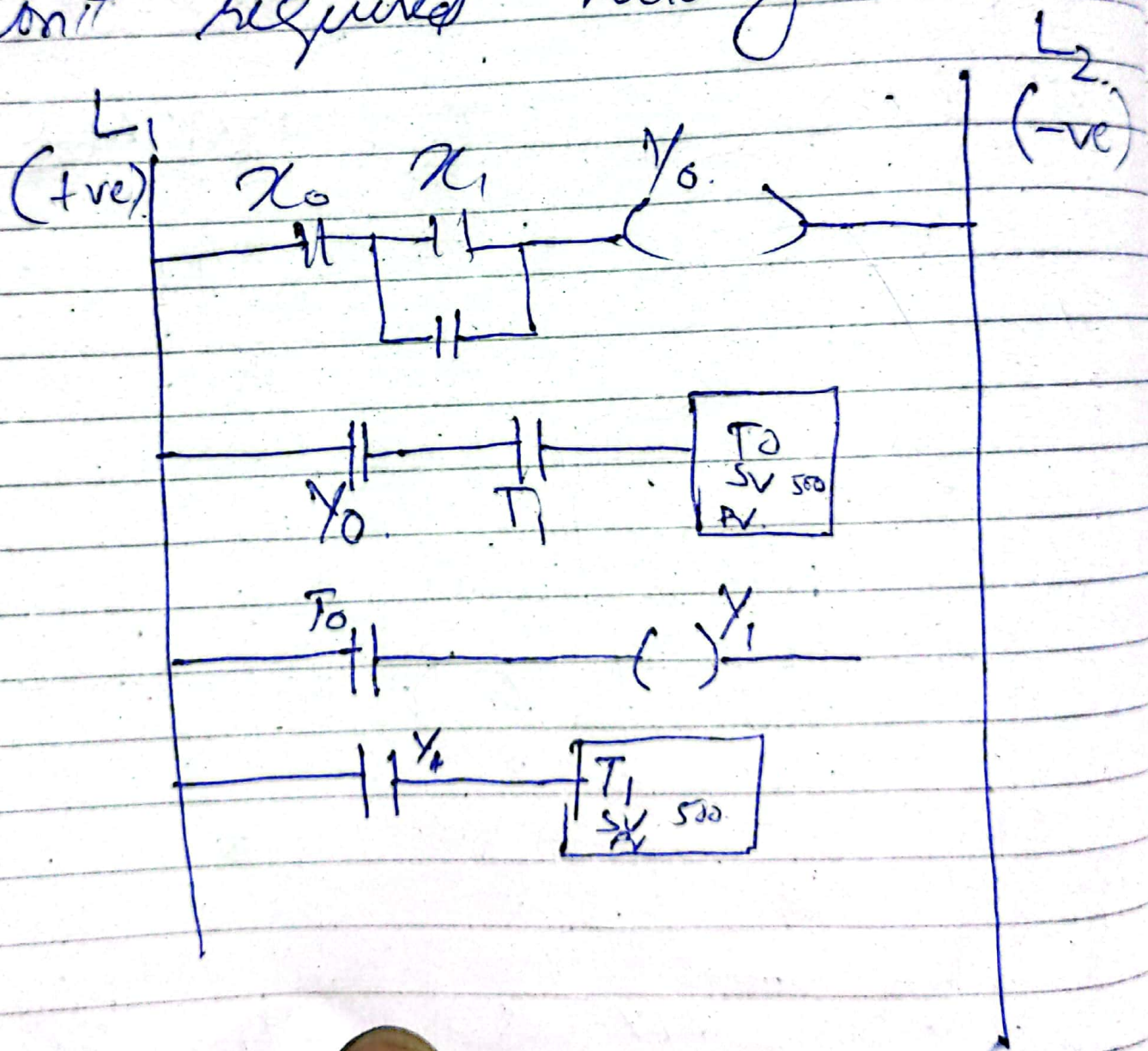
and One timer can also be used as OFF DELAY and on delay. Timer command is also of separate and function block is also used to. For using timer it is important that timing address should be given. Timer command output is also used and separate is also used. as below



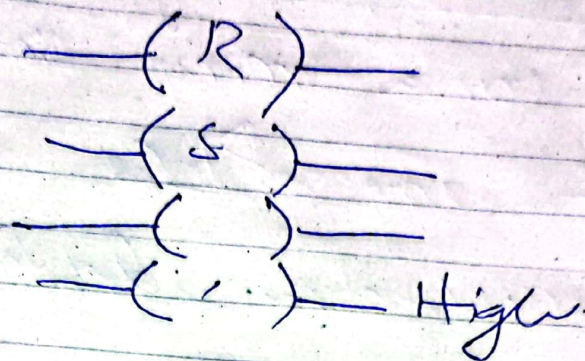
Inverse coil

The INVERSE COIL By

default is built in ON condition
 means HIGH one when supply
 is provided this will become
 off means LOW Inverse coil
 don't requires holding.



Set and Reset coil.



SET means ON condition and Set Reset (coil) command is used output same address. because Set command is ON on providing supply and after supply disconnected is also ON continuously if we have to OFF Set coil then we have to ON the supply of Reset coil for Set coil Hold is required.

TYPE of Relay

There are many relays built in any PLC which are called by different Names.

- 1) Retentive Relay
- 2) Non-Retentive Relay
- 3) SPECIAL Relay

Retentive relay is also called M Retentive Relay basically used for HOLDING and it retains the position and it is called M relay.

and its address M_6-M_{799} .

Note :-

These all relay don't have connection with physical relay.

These are not physical but used to complete the logic and its biggest advantage is that it saves the I/Os.

Non-Retainable Relay :-

The address of non-retainable relay is $M_{800}-M_{1400}$. and this relay not retain its own position.

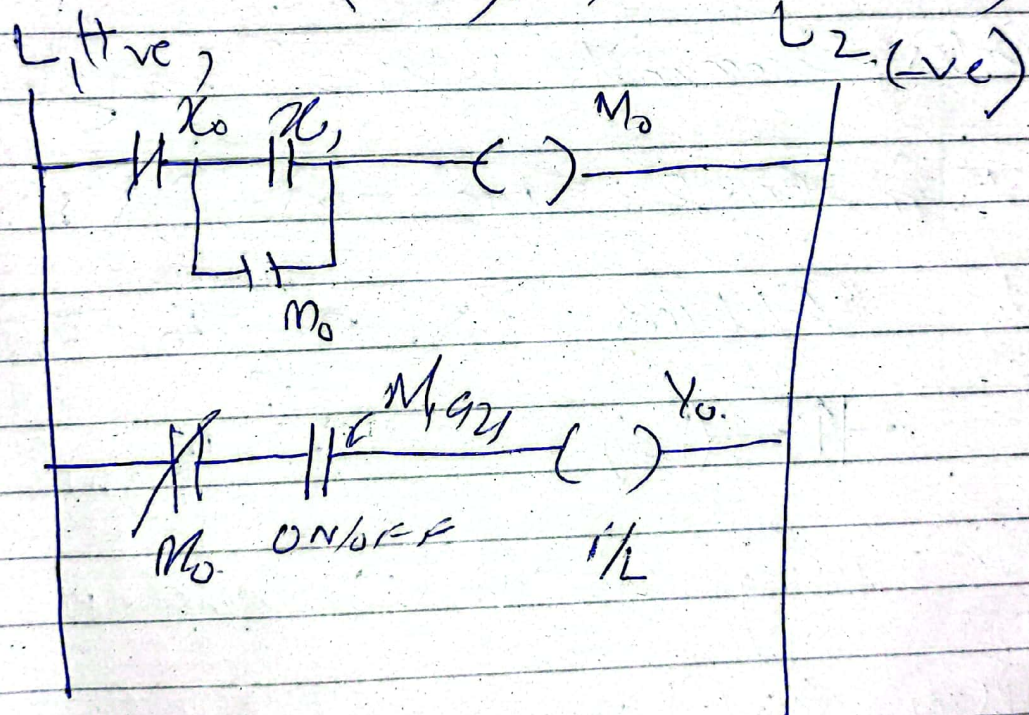
mean if the supply is
~~cut~~ cut of the line it will not
cut off. The biggest advantage
of non-retentive command is that
if the supply failure occurs it
will not off that's why it is
mostly used with counter that's
why it not zero the counter.

SPECIAL RELAY

Special relay built-in it self
internally ON/OFF and ON/OFF
continuously whether if supply is
provided or not It is used as

Contact in program and internally
ON/OFF and its timing of ON/OFF
is divided into

- 1) M1920 (0.01s) 3) M1922 (1sec)
- 2) M1921 (0.15) 4) M1923 (2sec)



COUNTER COMMAND

C. command work on display
on continuous pulse and save

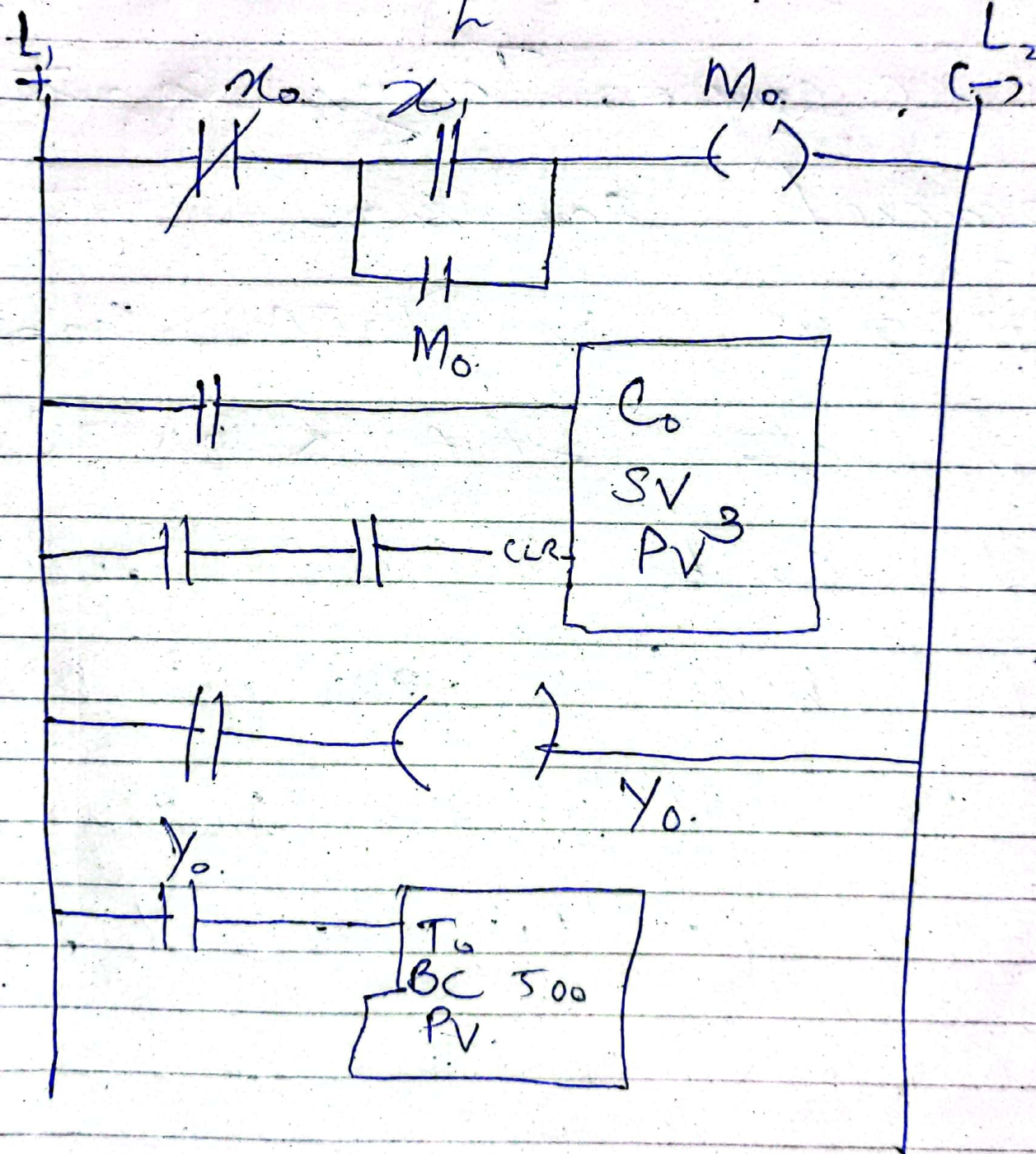
its own value in memory, just
like timer ^{from} counter command we can
energize the output. This PLC
have 256 counters built in having
address from C0 - C255. The
counter command is used through SENSOR
and for SENSOR we use RISING EDGE
and FALLING EDGE ^{with} in the TOOL
bar.

↑↑ (low)

↓↓ (High)

For using counter command it is
compulsory that it should be given an
address. Counter command have set
value and preset value. And

whenever we set value in counter,
 it starts according to this value
 and this value ^{will} save in its memory.



For use of counter. it is necessary
that we clear its memory, because
it will not start until we clear
its memory. Through counter
command any value either
ANALOGUE OR DIGITAL can be
move into DATA REGISTER
and can be COMPARE. For example
IF there is analogue signal
in the m/c then Analogue
register is used to read its value
In counter registers are in the
form of blocks and this

starts from 8 bit, 16 bit and 32 bit
and soon ~~the~~ ^{other}, Other than that we'll
move forward plus ^{eg: 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192, 16384, 32768, 65536, 131072, 262144, 524288, 1048576, 2097152, 4194304, 8388608, 16777216, 33554432, 67108864, 134217728, 268435456, 536870912, 1073741824, 2147483648, 4294967296, 8589934592, 17179869184, 34359738368, 68719476736, 137438953472, 274877906944, 549755813888, 1099511627776, 2199023255552, 4398046511104, 8796093022208, 17592186044416, 35184372088832, 70368744177664, 140737488355328, 281474976710656, 562949953421312, 1125899906842624, 2251799813685248, 4503599627370496, 9007199254740992, 18014398509481984, 36028797018963968, 72057594037927936, 144115188075855872, 288230376151711744, 576460752303423488, 1152921504606846976, 2305843009213693952, 4611686018427387904, 9223372036854775808, 18446744073709551616, 36893488147419103232, 73786976294838206464, 147573952589676412928, 295147905179352825856, 590295810358705651712, 1180591620717411303424, 2361183241434822606848, 4722366482869645213696, 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In PLC Other than COUNTER
Command Three important
commands were used

1) COMPARE COMMAND

2) DATA MOVEMENT COMMAND

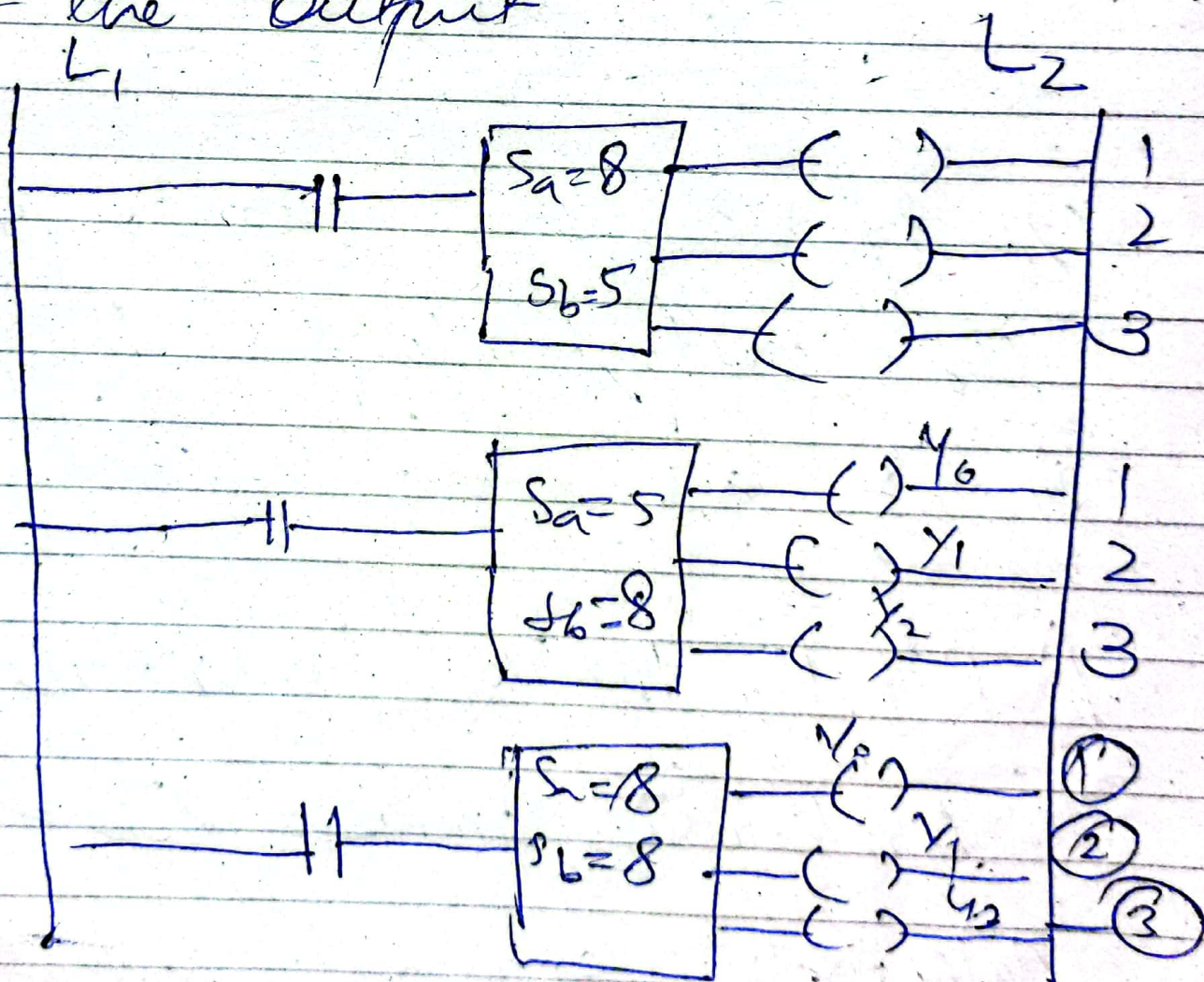
3) ARITHMETIC COMMAND

These above three commands
help in completing our LOGIC.
And without these commands we
cannot complete our Logic/Program.
And these commands also have
contact with physical contact.

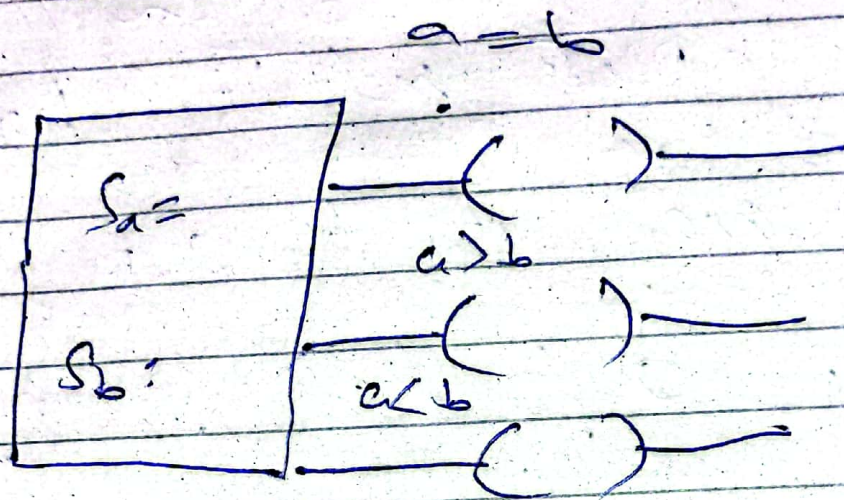
21/1/2022

COMPARE COMMAND

The compare command is taken out from function block and is used to compare the two inputs and it has three conditions and it is also used to get the output.



In compare command S_a is source and where value is read is the destination in S_b there is used.

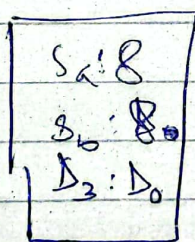


- 1) If a is equal to b
the output lamp 1 is ON.
- 2) If a is greater than b

ARITHMETIC COMMAND

An arithmetic command is basically Mathematical command and it works

like calculation in arithmetic command we put the value in data register where move is require. we can only read the value of data register (D). where as from D we can read and write the value of D. From Arithmetic command. S_a and S_b comes in D after calculation.



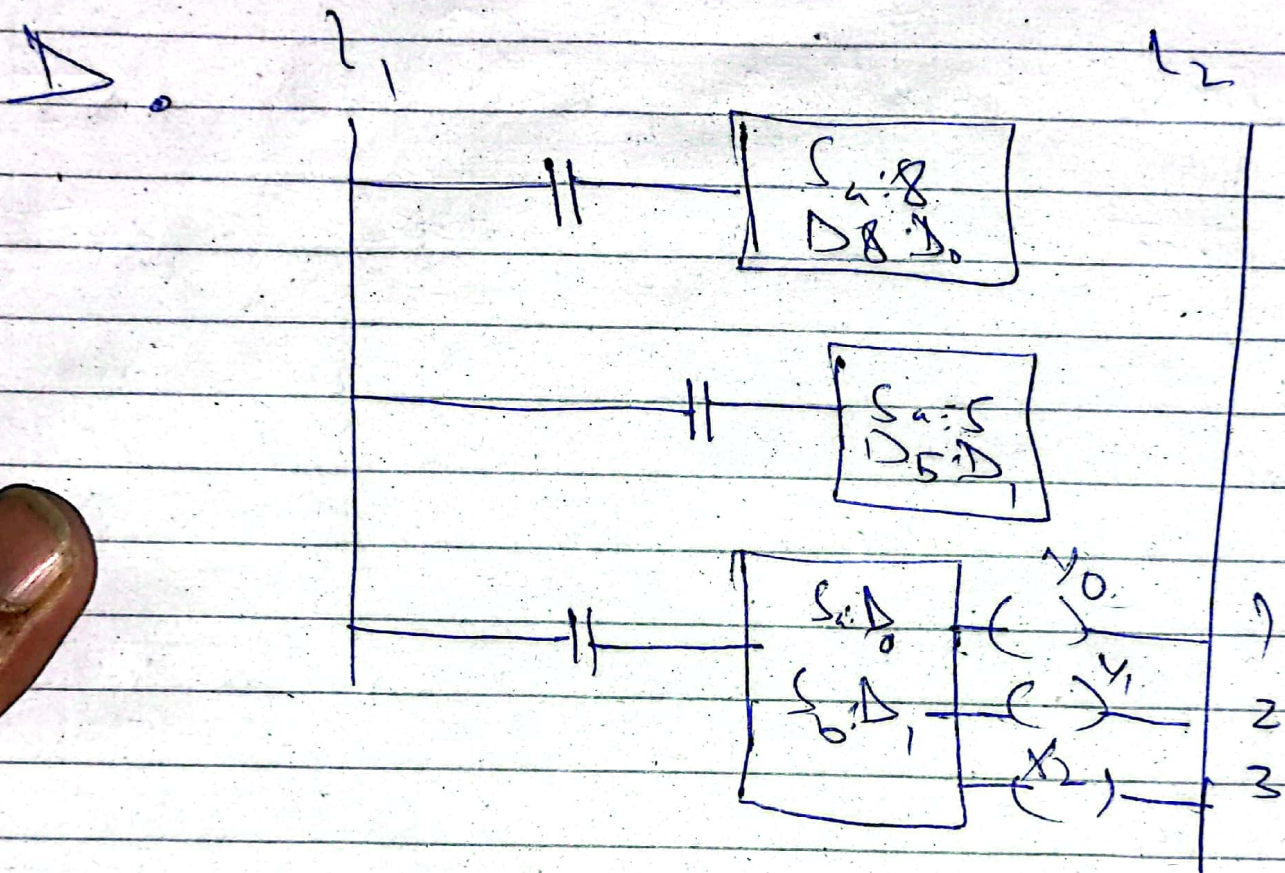
Data Move Command :-

Data Movement command is also

also taken out from function block.

From its "name" it is clear that

in this S_a value is move the

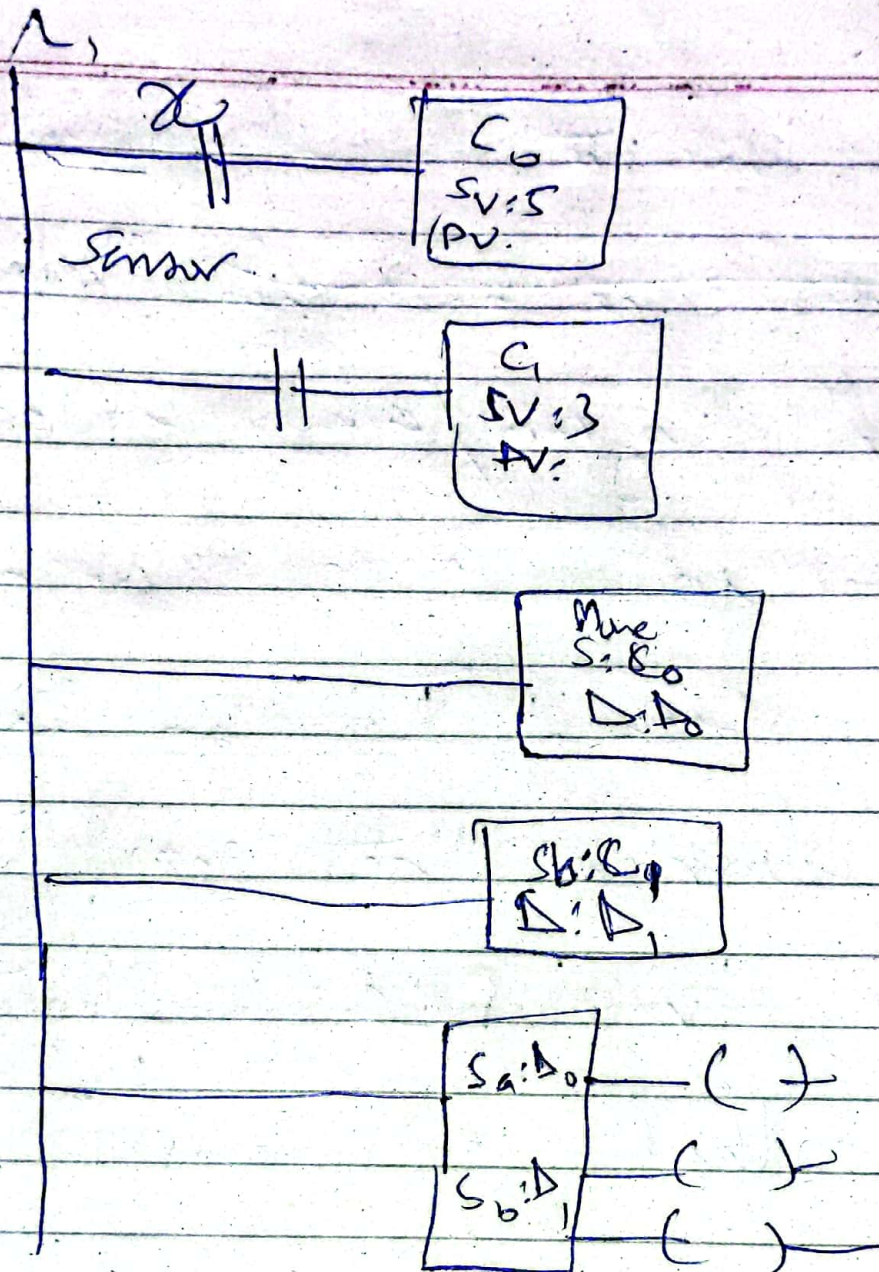


Note:-

In these all these commands we

are also read and write the timer

and counter S_a and S_b .



Status Page:-

To read ^{and understand} our ~~the~~ program we made status page, which shows the whole working of input and output.

status page take the default values
which is ~~is save~~ ^{is save} in the back end. Through
status whole program/circuit is easily
read. Changing and thinking, done
will also done. It can take
out by clicking the magnifying
glass of this PLC software.
Other than that is Siemens company
software develop the status page by
default where as on other softwares
we have to develop it by own.

Projects

When ever we made project first of all we made the DOL circuit.

Project 1

R/F (Reverse / Forward) circuit

automatic.

Project ③

UTILITIES:-

The Utilities departments are called the backbone of any industry.

Utility department have seven departments section.

- 1) Generator Room
- 2) RO PLANT
- 3) COMPRESSORS
- 4) CHILLER Department
- 5) Boiler
- 6) Heat recovery Plant
- 7) Humidification Plant.

As a Engineer we have some responsibility of utility departments following things

- 1) Pumps
- 2) Fan supply
- 3) Exhaust fan
- 4) Cooling towers
- 5) Lightification
- 6) Power circuit.

and all the MCB panels of all these m/c's. Basically all these utility departments have their own managers who are mostly mechanical

Engineers and other than these every department have its teams and incharges. Because its operation

and department head by Gm
from their instructions (Gm and owner)
that if there is any first aid
required by these plants that these
will provide ~~the~~ also. We don't
do first aid of any machinery.

Other than machinery its accessories
its responsibility of Engineers.

BOILER

Boiler department use the
sullit and resin for softer plant.
whose process the water and
with ~~the~~ boiler water is feed

On Boiler exhaust economizer is attached.

What is purging time of boiler?
" " LFL programming?

(Question)

What is the importance of boiler sequence in the beginning time of boiler? Or what is its importance.

On opening the main of boiler the operator first open the main of boiler and then water feed pump on after that boiler (ON) by taking its beginning time.

Berging time means boiler release
all the gases inside into means
mode motor will go forward
and reverse by limit switch then
in this time all gases (release)
and damper is stop at the limit
and glenze so berging time is
complete there.

Boiler always install according to
the ton means (per hour) how much
ton of steam its generate. Basically
boiler are of two phase and of 3 ϕ
available. Boiler have water

and ~~boilers~~ are either water is inside the tube or outside the tube or gas vice versa.

Electrically Boiler circuit are divided into two supply.

- ② gas fire control
- ① water feeding controls

To control the sequence of water in boiler LFL were installed and today
(Pressure)

Modern / latest technology PLC is used to control the boiler sequence automatically. On opening the main by operator the pressure

switches were activated through
pressure switches LFL were activated
through which sequence was fed.
Then through LFL mode motor
start for bearing time. Dumper
hold the motor in certain
opening which again feed the command
to LFL after completing the bearing
time program first open the pilot
valve and simultaneously ignition
also open. pilot valve is open
and ignition supply off. So the
pilot valve is open and UV

sensor sense its flame holding
command send to LFL. When
sensor sense its UV so gas main
main valve open and simultaneously
motor start running and both
work simultaneously. Similarly boiler
come at high fire. Boiler fire
is control through air and gas
mixture. Boiler ON at high fire.
motor ~~temp~~ as control
air and gas through damper.
When steam pressure get low so
through pressure switch boiler come

at low fire through pressure
switch on low fire mode
motor close 70% dampers and
main gas valve is open continuously.
This way LFL program control
the sequence of boiler through
pressure switch. and when steam
utilize the pressure of steam reduces
so motor start running through
pressure switch. Through this boiler is
on High fire. In this way program
motor switch control the mode motor
and flame is Blue color always.